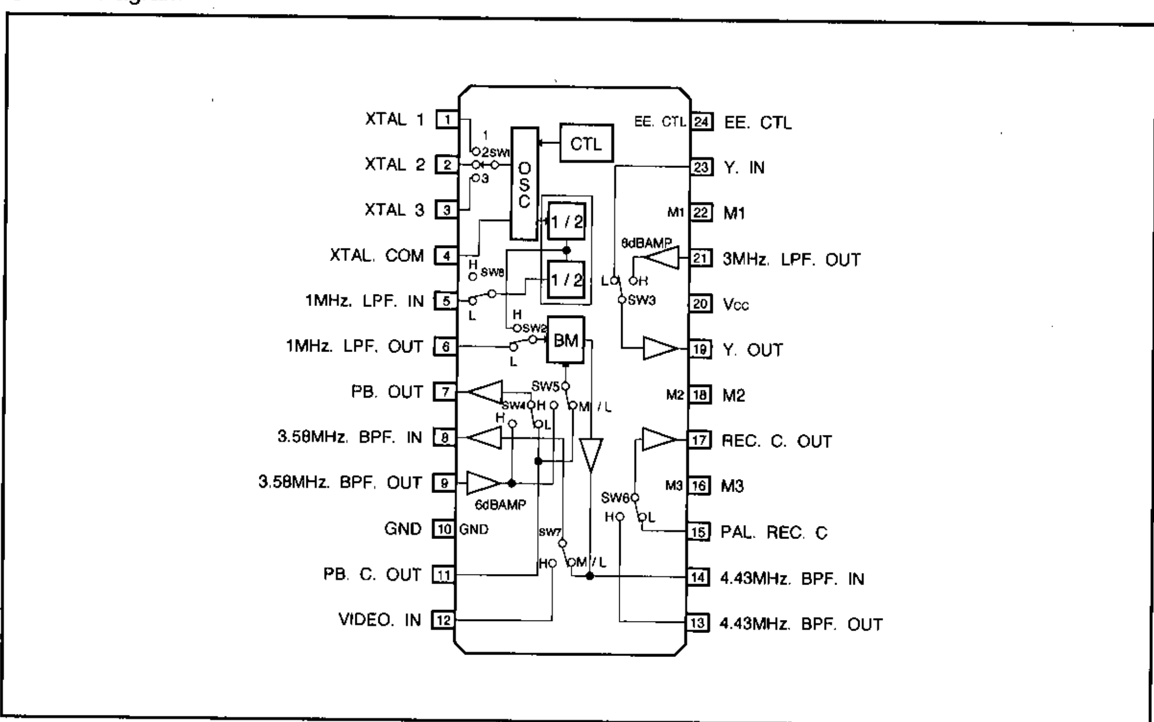
Chroma signal frequency converter
BA7049S/BA7049FS

The BA7049S and BA7049FS convert NTSC, PAL-M and PAL-N chroma signal subcarrier frequencies to the PAL format 4.433619MHz to allow PAL format processing circuits to handle record and playback signals for these other formats. These ICs facilitate the development of multi-format VCRs.

●Applications
Multi-format VHS VCRs.

●Features
1)Converts record and playback signals to standard format.
2)Compatible with up to three other formats in addition to PAL.
3)Y and chroma system filter switches are all built-in. Few external components required.

●Block diagram



●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Applied voltage	$V_{CC\,Max.}$	8.0	V
Power dissipation	Pd	800 *	mW
Operating temperature	Topr	−25~70	℃
Storage temperature	Tstg	−55~125	℃

* Reduced by 8.0mW for each increase in Ta of 1°C over 25°C.

●Recommended operating conditions (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating supply voltage	V_{CC}	4.5	5.0	5.5	V

●Electrical characteristics (Unless otherwise specified: Ta=25℃ and Vcc=5.0V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Circuit current	I_{CC}	20.5	31.0	41.5	mA	
0dB amplifier voltage gain	G_0	−0.5	0.0	+0.5	dB	f=1MHz Vin=0.5V_{PP}
0dB amplifier frequency characteristic	f_0	−2.0	+0.0	+1.0	dB	f=5MHz / 1MHz Vin=0.5V_{PP}
6dB amplifier voltage gain	G_6	+5.5	+6.0	+6.5	dB	f=1MHz Vin=0.25V_{PP}
6dB amplifier frequency characteristic	f_6	−2.0	+0.0	+1.0	dB	f=5MHz / 1MHz Vin=0.25V_{PP}
Interchannel crosstalk	C_T	−	−45	−40	dB	f=4.43MHz Vin=0.5V_{PP}
Frequency divider output level	V_{OE}	0.50	0.85	1.30	V_{PP}	When 3.4MHz/3.58MHz X'tal is oscillating
BM output level	V_{OB}	125	185	245	mV_{PP}	f=3.58MHz Vin=0.3V_{PP}
BM carrier leak	CL_B	−	−40	−30	dB	f=3.58MHz Vin=0.3V_{PP}
Switch voltage 1	V_{TH1}	1.00	2.00	3.00	V	M1, M2, M3
Switch voltage 2	V_{TH2}	3.50	3.90	4.35	V	EE. CTL

●Guaranteed design items (Unless otherwise specified: Ta=25℃ and Vcc=5.0V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
0dB amplifier voltage gain	G_0	−1.0	0.0	+0.5	dB	f=4MHz Vin=0.5V_{PP}

◎ Not designed for radiation resistance.

●Logic truth table

M1	M2	SW1
L	L	—
H	L	1
L	H	2
H	H	3

M1	M2	SW3, 4, 6
L	L	L
H	L	H
L	H	H
H	H	H

M1	M2	SW8
L	L	H
H	L	L
L	H	L
H	H	L

M3	SW2
L	L
H	H

EE. CTL	SW5, 7
H	H
M / L	M / L

●Input / output circuits

Pin No.	Function	Pin voltage DC	Pin voltage AC	Input/output resistance	Equivalent circuit
1	XTAL 1	2.0V	1.0VPP	150Ω	CTL → 100 500μA 1
2	XTAL 2	2.0V	1.0VPP	150Ω	CTL → 100 500μA 2

Pin No.	Function	Pin voltage		Input/output resistance	Equivalent circuit
		DC	AC		
3	XTAL 3	2.0V	1.0VPP	150Ω	CTL, 100, 500μA, 3
4	XTAL. COM	2.0V	1.7VPP	5kΩ	10k, 5k, 100, 4
5	LPF. IN (1MHz)	4.0V	850mVPP	130Ω	100, 1mA, 5
6	LPF. OUT (1MH)	2.0V	500mVPP	20kΩ	20k, 2V, 100, 100μA, 6
7	PB. OUT	2.0V	300mVPP	130Ω	2V, 2k, 100, 7

Pin No.	Function	Pin voltage		Input/output resistance	Equivalent circuit
		DC	AC		
8	BPF. IN (3.58MHz)	2.3V	1.0V_{PP}	150Ω	
9	BPF. OUT (3.58MHz)	2.0V	150mV_{PP}	20kΩ	
10	GND	0V	—	—	
11	PB. C. OUT	2.0V	300mV_{PP}	20kΩ	
12	VIDEO. IN	2.0V	300mV_{PP}	20kΩ	

Pin No.	Function	Pin voltage		Input/output resistance	Equivalent circuit
		DC	AC		
13	BPF. OUT (4.43MHz)	2.0V	150mVPP	20kΩ	20k, 2V, 100, 100μA, 13
14	BPF. IN (4.43MHz)	2.2V	1.0VPP	130Ω	2.25V, 2.8k, 100, 14
15	PAL. REC. C	2.0V	150mVPP	20kΩ	20k, 2V, 100, 100μA, 15
16	M3	60mV	—	50kΩ	26k, 16, 50k, 30k
17	REC. C. OUT	2.0V	150mVPP	130Ω	2V, 2k, 100, 17

Pin No.	Function	Pin voltage		Input/output resistance	Equivalent circuit
		DC	AC		
18	M2	60mV	—	50kΩ	18, 50k, 30k, 10k
19	Y. OUT	2.0V	400mVPP	130Ω	2V, 2k, 100, 19
20	VCC	5.0V	—	—	20
21	LPF. OUT (3MHz)	2.0V	200mVPP	20kΩ	20k, 2V, 100, 100μA, 21
22	M1	60mV	—	50kΩ	22, 50k, 30k, 10k

Pin No.	Function	Pin voltage DC	Pin voltage AC	Input/output resistance	Equivalent circuit
23	Y. IN	2.0V	400mV$_{PP}$	20kΩ	
24	EE. CTL	0.5V	—	2MΩ or more	

●Circuit operation

Recording

A balance modulator is used to convert the subcarrier frequency of the input chroma signal to PAL-format subcarrier frequency.

The local oscillator used for frequency conversion uses a x'tal to generate a frequency of four times the required frequency. This frequency is divided-by-four internally using a frequency divider.

Signals converted to the PAL-format subcarrier frequency by this IC are input to a chroma processing IC equipped with a PAL filter. By operating the circuit in NTSC mode for NTSC signals and in PAL mode for PAL-M and PAL-N signals, a low-frequency output signal in the converted format is obtained.

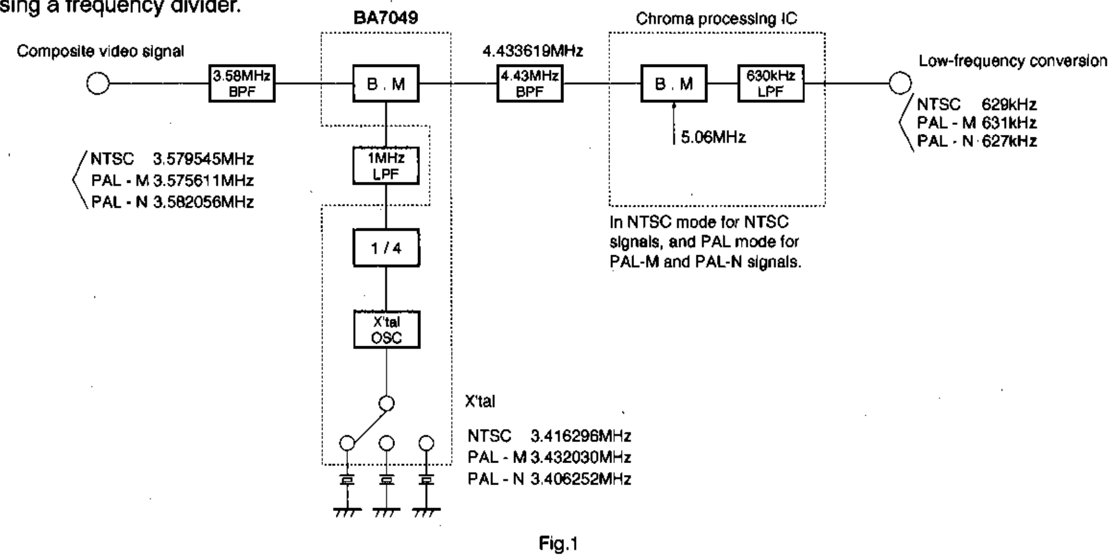


Fig.1

●Circuit operation

Playback

During playback, an NTSC or PAL signal with a subcarrier frequency of 4.433619MHz is output. Using the opposite procedure to that of recording, these signals are converted to NTSC, PAL–M, or PAL–N subcarrier–frequency signals.

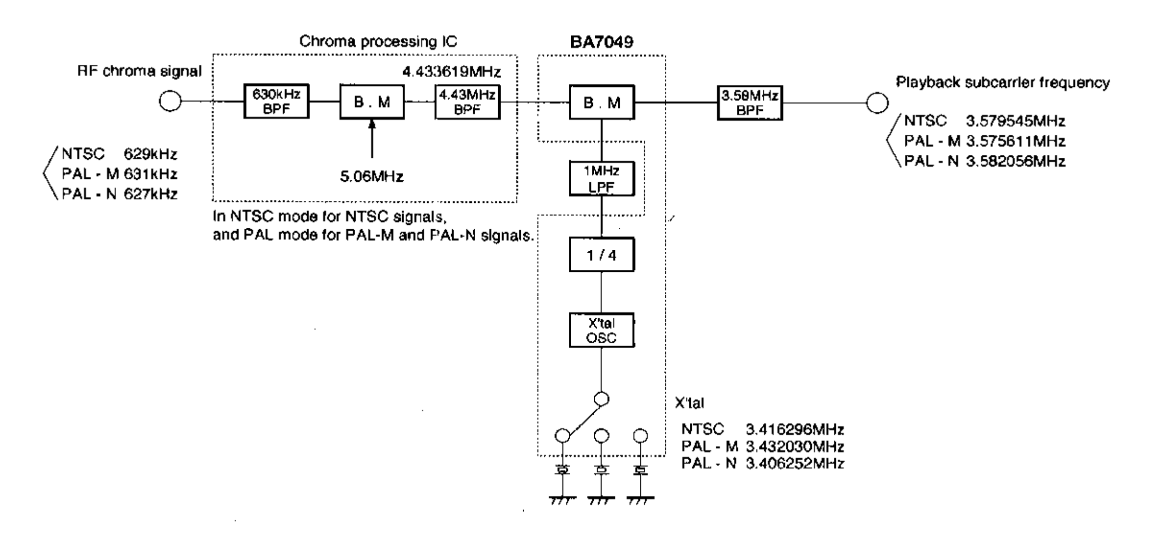


Fig.2

●Application example

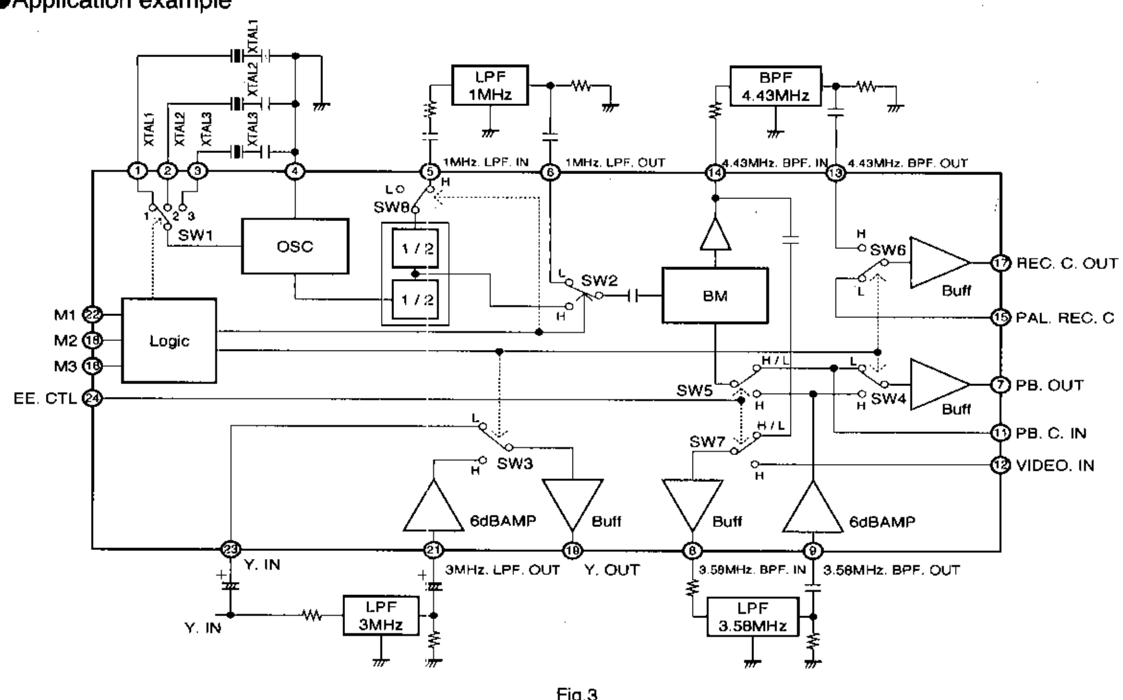


Fig.3

● Operation notes

External components for the x'tal oscillator

The external circuit for the oscillator is shown below. The capacitor values are for reference only. Determine suitable values for the capacitors after consulting with the crystal manufacturer.

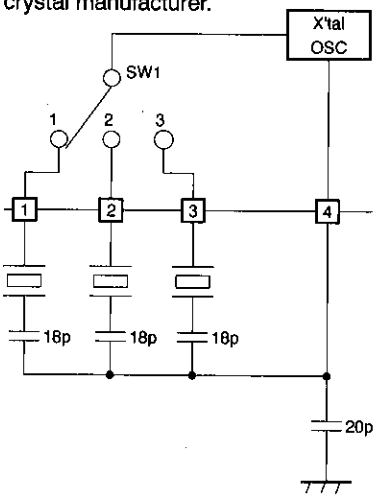


Fig. 4

● Electrical characteristic curves (Ta=25℃)

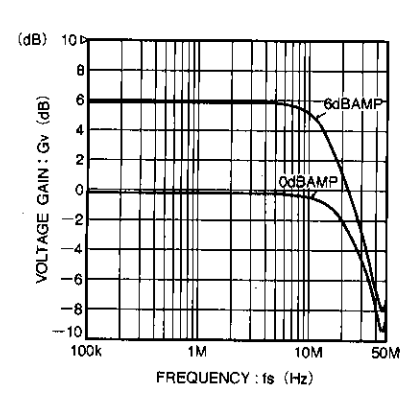


Fig. 5 SW frequency characteristics

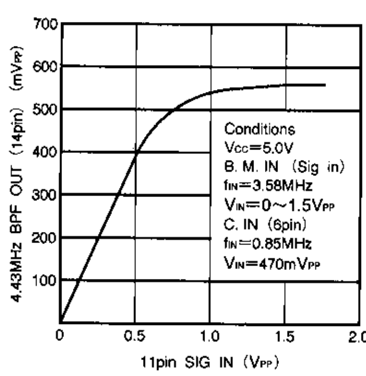


Fig. 6 B.M.D. range characteristics

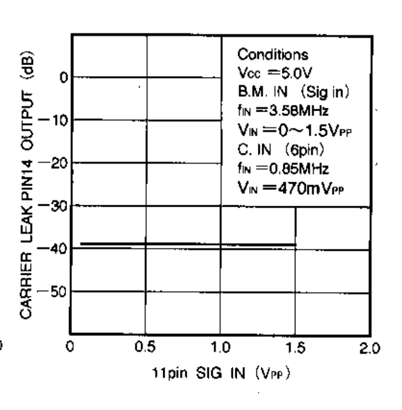


Fig. 7 B.M. carrier leak characteristics

6dB AMP
9pin in → 7pin out
21pin in → 19pin out
0dB AMP
11pin in → 7pin out
12pin in → 8pin out
13pin in → 17pin out
15pin in → 17pin out
23pin in → 19pin out

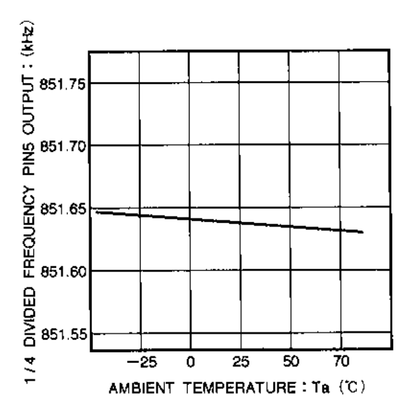


Fig. 8 1/4 frequency divider frequency vs. ambient temperature characteristics.

●External dimensions (Units: mm)

